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**PRESIDENCY UNIVERSITY
BENGALURU**

**SCHOOL OF ENGINEERING
END TERM EXAMINATION - JUN 2023**

Semester : Semester VI - 2020

Course Code : ECE3031

Course Name : Sem VI - ECE3031 - Applications of Deep Learning

Program : ECE

Date : 16-JUN-2023

Time : 9.30AM - 12.30PM

Max Marks : 100

Weightage : 50%

Instructions:

- (i) Read all questions carefully and answer accordingly.
 - (ii) Question paper consists of 3 parts.
 - (iii) Scientific and non-programmable calculator are permitted.
 - (iv) Do not write any information on the question paper other than Roll Number.
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PART A

ANSWER ALL THE QUESTIONS

(5 X 2 = 10M)

1. Convolutional Neural Networks (CNNs) are very popular in image processing applications. Explain why CNN is popularly used in image processing applications. (CO1) [Knowledge]
2. As the size of neural network increases the error in the predicted output also increases. Write short on curse of dimensionality in neural networks. (CO1) [Knowledge]
3. Training of Deep Neural Networks is very challenging due to large dataset size and resource requirements. Mention any four methods to reduce training time and resource requirement during training process. (CO1) [Knowledge]
4. The Artificial Neural Networks (ANN) and Deep Neural Networks (DNN) are popularly used terms in machine learning. Differentiate between ANN and DNN (any four points). (CO1) [Knowledge]
5. Forward propagation and backward propagation are the two steps in the training of neural network. Mention the advantages of backward propagation in neural networks. (CO1) [Knowledge]

PART B

ANSWER ALL THE QUESTIONS

(2 X 15 = 30M)

6. a) The single layer perceptron can classify only linear input combinations. As a designer how you will implement Ex-OR classification using perceptron and also mention the issues in use of single layer perceptron in implementation Ex-OR gate operation. [5M]
b) The Googlenet is a specially developed Convolutional Neural Network (CNN) which is intended to provide a solution to the problem statement given in ImageNet 2014. Elaborate how Googlenet achieves very less error rate and high accuracy in localization and classification on ILSVRC 2014 dataset. Elaborate the difference in mechanism used by Googlenet and Alexnet in image classification and localization. [10M]
(CO2) [Comprehension]

7. A machine learning engineer is given with the task of developing deep learning based solution for the lung cancer detection from the input image. The dataset of lung X-Ray images is taken from Oncology department of a reputed hospital. The output of the network is binary in nature. Considering yourself as a machine learning engineer, please provide a brief comment on the following issues.
- a) Describe the stepwise procedure of neural network based application development. [5M]
- b) Describe the function of the convolutional layer in the identification of lung cancer. [5M]
- c) Could the usage of VGG result in greater accuracy? Justify your answer. [5M]
- (CO4) [Comprehension]

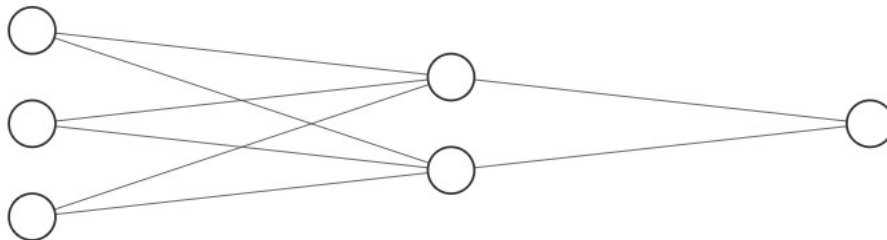
PART C

ANSWER ALL THE QUESTIONS

(3 X 20 = 60M)

8. Backpropagation is the iterative procedure to reduce the error in the in the output prediction of the neural network. For the below given neural network compute one iteration of backpropagation process and show the use of gradients in the error correction process. Use following values for the computation.

W11=0.25	W12=0.20
W21=0.3	W22=0.4
W31=0.35	W32=0.55
WH1=0.25	WH2=0.45
B1=1	B2=1
X1=0.1	X2=0.3
X=0.2	
Target values	
O=0.3	
Learning Rate=0.2	



Input Layer $\in \mathbb{R}^3$

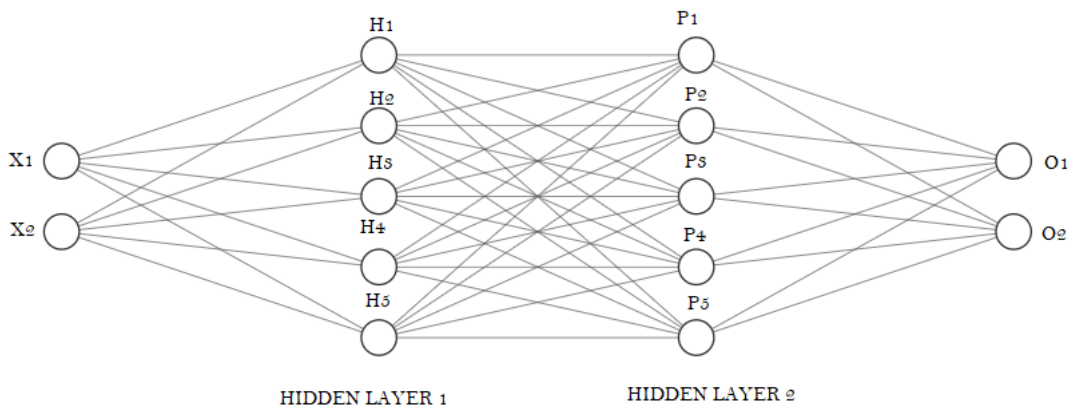
Hidden Layer $\in \mathbb{R}^2$

Output Layer $\in \mathbb{R}^1$

(CO3) [Application]

9. a) Activation function is used to limit neural network output in a specified limit. ReLu, Sigmoid and Tanh are widely used activation function in neural networks. Compare them in detail with respect to any ten points. [10M]
- b) Compute the forward propagation output using Sigmoid activation function in each layer of network (except input layer). Use following values of weights and bias. [10M]

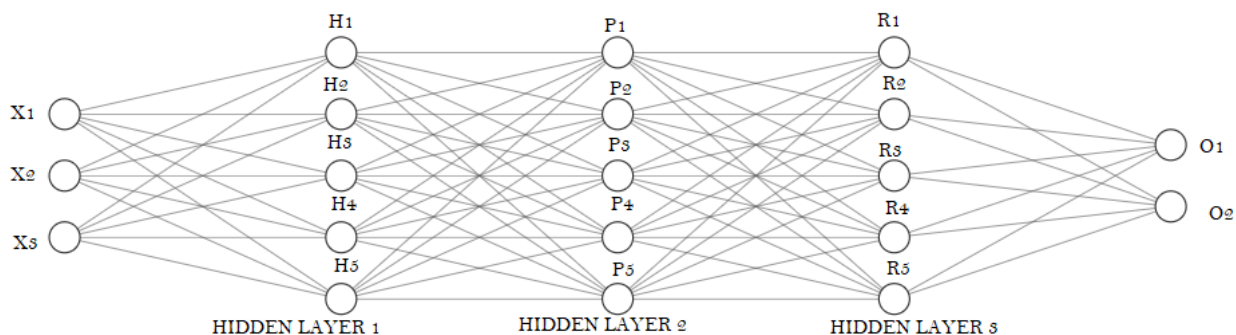
W11=0.13	W12=0.54	W13=0.38	W14=0.46
W15=0.22	W21=0.39	W22=0.27	W23=0.49
W24=0.13	W25=0.15		
WH11=0.28	WH12=0.85	WH13=0.87	WH14=0.97
WH15=0.24	WH21=0.61	WH22=0.64	WH23=0.21
WH24=0.33	WH25=0.51	WH31=0.43	WH32=0.86
WH33=0.58	WH34=0.42	WH41=0.19	WH42=0.85
WH43=0.48	WH44=0.41	WH45=0.43	WH51=0.46
WH52=0.34	WH53=0.33	WH54=0.28	WH55=0.27
WP11=0.56	WP12=0.52	WP21=0.59	WP22=0.54
WP31=0.23	WP32=0.24	WP41=0.26	WP42=0.31
B1=1	B2=1	B3=1	X1=1.35
X2=0.9			



(CO3) [Application]

10. The weight and bias values of the neural network are used to compute the output which is also known as prediction. For the multilayer neural network shown below, compute the predictions O1 and O2 using forward propagation technique. Use the given values weights and bias (Consider 10% dropout in each hidden layer for calculation).

X1=0.2	X2=0.25	X3=0.3		
W11=0.11	W12=0.16	W13=0.27	W14=0.21	W15=0.32
W21=0.11	W22=0.16	W23=0.21	W24=0.26	W25=0.31
W31=0.4	W32=0.45	W33=0.5	W34=0.55	W35=0.61
WH11=0.11	WH12=0.22	WH13=0.32	WH14=0.42	WH15=0.52
WH21=0.16	WH22=0.26	WH23=0.36	WH24=0.46	WH25=0.56
WH31=0.17	WH32=0.27	WH33=0.37	WH34=0.47	WH35=0.57
WH41=0.18	WH42=0.28	WH43=0.38	WH44=0.48	WH45=0.58
WH51=0.19	WH52=0.29	WH53=0.39	WH54=0.49	WH55=0.59
WP11=0.31	WP12=0.32	WP13=0.33	WP14=0.34	WP15=0.35
WP21=0.41	WP22=0.42	WP23=0.43	WP24=0.44	WP25=0.45
WP31=0.71	WP32=0.72	WP33=0.73	WP34=0.74	WP35=0.75
WP41=0.81	WP42=0.82	WP43=0.83	WP44=0.84	WP45=0.85
WP51=0.91	WP52=0.92	WP53=0.93	WP54=0.94	WP55=0.95
WR11=0.14	WR12=0.24	WR13=0.34	WR14=0.44	WR15=0.54
WR21=0.1	WR22=0.11	WR23=0.12	WR24=0.13	WR25=0.14
WR31=0.2	WR32=0.21	WR33=0.22	WR34=0.23	WR35=0.24
WR41=0.3	WR42=0.31	WR43=0.32	WR44=0.33	WR45=0.34
WR51=0.4	WR52=0.41	WR53=0.42	WR54=0.43	WR55=0.44
WR11=1.5	WR21=1.5	WR31=1.5	WR41=1.5	WR51=1.5
WR12=0.5	WR22=0.5	WR32=0.5	WR42=0.5	WR52=0.5
B1=1	B2=1	B3=1	B4=1	



(CO3) [Application]